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THE OPILIONID GENERA *SABACON* AND *TOMICOMERUS* IN AMERICA (OPILIONES, TROGULOIDEA, ISCHYROPSALIDAE)

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ABSTRACT

The ischyropsalid genera *Sabacon* and *Tomicomerus* in America are reviewed, and three new species of *Sabacon* are described from the western United States. The family name Sabaconidae Dresco is evaluated and not accepted as distinct from Ischyropsalidae. *Sabacon crassipalpe* (Koch), described from Siberia, probably does not occur in America. The genus *Tomicomerus* and its single species *T. bryanti* are redescribed from the single known specimen.

INTRODUCTION

The opilionid genus *Sabacon* was established in 1879 by Eugene Simon, for the European species *S. paradoxum*. Species of the genus are easily distinguished from any others within the superfamily Troguloidea by the peculiar pedipalpi—they are usually much thickened and densely set with stiff, fine setae. The palpal tarsus is short, pyriform, and reflexed against the longer tibia. As yet the adaptive or functional significance of these palpi remains unknown.

In the same year as Simon's publication, Koch (1879) described *Nemastoma crassipalpis* from eastern Siberia, but his description left no doubt that he was dealing with a species of *Sabacon*. In America, the first species of *Sabacon* to be described was *S. cavicolens*, which A. S. Packard (1884) placed in a new genus, *Phlegmacera*. In 1893, Weed described *Sabacon spinosus* from New England, but his correct generic placement was ignored until 1914, when Roewer synonymized *Phlegmacera* with *Sabacon*. Following these original reports, species of the genus *Sabacon* have proven to be widespread in the northern hemisphere in temperate climates, even extending into the subarctic. The most southerly records are from high elevations in Nepal and from caves in the southeastern United States.

The center of speciation and diversification in *Sabacon* would appear to be in Asia. Suzuki (1964, 1965, 1966, etc.) and other workers in Japan have described a half-dozen or more distinct species from Japan and Korea, and more recently, Martens (1972) has described six unusual species from Nepal. In contrast, Europe probably has at the most four rather poorly differentiated species. In North America, the new species described below bring our total to six, four of which are found in the Pacific northwest.

The genus *Tomicomerus* has a simpler history. Banks (1898) described *Phlegmacera bryanti* as a new species from the Malaspina Glacier, near Mt. St. Elias, Alaska. Unfortunately, as is frequently the case with Banks' opilionid work, the description did not

involve direct and detailed comparison with other related, described species. In 1899, Pavesi apparently obtained material of the same species and described it as *Tomicomerus bispinosus*. His description contained data which clearly set the species apart from others in *Phlegmacera* (*Sabacon*), and subsequently Banks and others recognized Pavesi's generic name, but priority dictated the use of the combination *Tomicomerus bryanti* (Banks). My first impression was that *Tomicomerus* would become a synonym of *Sabacon*, since the main diagnostic feature, false articulations in the leg femora, is to be found in two Japanese and one American species that are otherwise well accommodated in *Sabacon*. The materials used by the original authors have long since probably been lost, and no illustrations have ever been made. A single specimen, albeit in poor condition, is in the American Museum of Natural History. *Tomicomerus* is a fully distinct genus sharing characters of *Sabacon* and *Taracus*.

TAXONOMIC CHARACTERS

Despite a wealth of characters useful in distinguishing species from one another, it is becoming apparent that attempts to group species and genera of the superfamily Troguloidea into meaningful families presents difficulties. So long as one uses the typological concept of "generic characters' or "familial characters," the task appears simple. However, detailed studies (Martens, 1969, 1972; Gruber, 1970) are beginning to reveal that these characters are distributed in various ways throughout species groups. Only when the known genera have been revised in detail, and most of the species surveyed, will it be possible with an assurance to group them into meaningful families. I suspect that there will be considerable debate over the eventual extent of the family Ischyropsalidae, in particular.

Martens (1972) has noted, following Suzuki and other Japanese authors, that within the genus *Sabacon*, the Asian species are easy to differentiate from one another on the basis of the male genitalia. The same appears to be true of the North American species. *Sabacon occidentalis* and *S. siskiyou* share many similarities, and, indeed the females are difficult to separate on the basis of qualitative characters. However, the male genitalia, particularly in the terminal parts, are distinctive. Of considerable use in males, but rather less so than the genitalia, are the palpi and chelicerae, especially the glands of the latter. The proportions of the palpi are somewhat difficult to assess because of the highly three-dimensional nature of these appendages and the consequent difficulties of arranging the palpi of several specimens for measurement so that the positions duplicate one another. The teeth found on the distal inner part of the male palpal patellae are useful, though the three western species for which males are known are quite similar in this respect. In the eastern species, *S. cavicolens* males have one or two such teeth, while *S. mitchelli* males have a large distal tooth and a row of tiny denticles.

Females not associated with males can be difficult, particularly if two similar species are sympatric, as is the case with *S. occidentalis* and *S. siskiyou*. Fortunately, it appears that these two species can be separated on the basis of the proportional lengths of the legs and the relative sizes of the postocular spines. Likewise, females of *S. mitchelli* are considerably smaller than those of the sympatric *S. cavicolens*. Females of *S. astoriensis* are not known. *Sabacon briggsi* is known only from the distinctive females, which have a pointed genital operculum and quite short legs when compared to *S. occidentalis* or *S. siskiyou*.

Immature specimens of two sympatric species are nearly impossible to separate, and

the bulk of the available material is immature. In the case of *S. cavicolens*, which occurs alone over a wide area, I have included immature specimens in the records (Map 1) to give a more complete picture of the distribution of this species. In the west, immatures have not been included because of the strong possibility of the presence of additional undescribed species.

NOMENCLATORIAL PROBLEMS

1. Family Sabaconidae Dresco. Dresco (1970) removed the genus *Sabacon* from the family Ischyropsalidae and placed it in the newly named, monobasic family Sabaconidae. His major reasons for doing so can be summarized in the following chart (translated from Dresco, 1970):

ISCHYROPSALIDAE	SABACONIDAE
carapace margin indented; chelicerae enlarged	carapace margin even; chelicerae not enlarged
tergites heavily sclerotized	tergites not heavily sclerotized
chelicerae of some males with a disto-apical "boss," never such a structure near middle (of basal segment)	basal segment of chelicera of males with a "boss" near middle of segment
palpi with scattered hairs, long and thin, juvenile specimens sometimes with a tarsal claw	palpi short and stout, densely set with stiff bristles never a tarsal claw
apical part of penis with spines	apical part of penis without spines

Dresco's conclusions are based on the European species of *Sabacon* and his own detailed study of the genus *Ischyropsalis*. Martens (1969), in probably the most detailed study ever made of any group of opilionids, revised the genus *Ischyropsalis*, and discovered that there were far fewer species than had been previously thought, and that the taxonomic characters previously used (size, shape, and spination of chelicerae, degree of fusion of abdominal tergites, teeth of the palpal patella, etc.) were not very useful. By means of actual mating experiments, Martens found that what he called "biospecies" of *Ischyropsalis* (reproductively isolated populations) were best marked by differences in the cheliceral glands of the males. These glands are located distoapically on the basal cheliceral segment and are evidently what Dresco (1970) refers to as "bosses." Martens (1969) found that these glands produce a secretion on which the females feed during copulation. He then used differences in the cheliceral glands of the same degree found in his biospecies to delimit "morphospecies," or populations which by analogy might be reasoned to be reproductively isolated. It is significant to note that Martens found the traditional species-marking characters listed above to be distributed through his biospecies and morphospecies in various ways.

Because Dresco failed to consider a full range of *Sabacon* species, and members of other genera related to *Ischyropsalis* in his study, the characters used to distinguish

Sabaconidae as a family do not hold up. Some American *Sabacon* species have the carapace indented in front, as in *Taracus* and *Ischyropsalis*, and the margin continues ventrally between the chelicerae. The enlarged chelicerae of the latter genera are simply adaptations for snail-eating (There is no direct evidence about the dietary habits of *Taracus*. H. W. Levi, personal communication, could not induce a Colorado species of *Taracus* to eat snails.) and do not of and by themselves indicate a close relationship. Some American and Asian *Sabacon* males are rather heavily sclerotized, and the degree of fusion of abdominal tergites is at best a species-level character in *Sabacon.*

Martens (1969) has elucidated the functional significance of the cheliceral glands of *Ischyropsalis* species males. It might be assumed that the glands of *Sabacon* males have a similar function. The presence or absence, or position of the glands is not of family-level significance. *Taracus* species lack the glands, and are otherwise typical ischyropsalids; *Sabacon mitchelli* is a typical species of that genus without enlarged glands, and some of the Japanese species lack them also. The form of the palpus sets apart the species of *Sabacon* from all others, but as its adaptive significance is not known, it may prove to be simply a specialization of the more general type of troguloid palpus. The absence of a claw in the juvenile stages is of little importance. And finally, the form of the penis is essentially similar in both groups. There are other ischyropsalid genera (*Taracus*, *Ceratolasma*) in which the penis is much more different from that of *Ischyropsalis* than in *Sabacon.*

For these reasons, I follow Martens (1972) in not recognizing Dresco's family name Sabaconidae, and include *Sabacon* with the ischyropsalids. I should add here, however, that I do not agree at this time with Gruber (1970) in placing *Hesperonemastoma* in the Ischyropsalidae, nor with Martens' (1971) implication that *Ortholasma*, *Cladolasma*, *Dendrolasma*, *Trilasma*, *Crosbycus* and *Ruaxphilos* belong there also. I plan to discuss this matter in detail in subsequent revisions dealing with these genera.

2. The status of *Sabacon crassipalpe* (Koch). In 1914, Roewer synonymized the three described species of American *Sabacon* (*cavicolens*, *spinosus* and *occidentalis*) with the Siberian *S. crassipalpe*. He has been followed in this ever since by most American authors (but see Crosby and Bishop, 1924), despite the fact that the evidence for such a synonomy does not exist. Koch's original description (1879) suggests little except that he was dealing with a species of *Sabacon*. There is nothing in the description that points to any particular species of the genus described since 1879, and as Asia undoubtedly has many as yet undetected species of *Sabacon*, it no longer seems justifiable to accept the tradition of American "Sabacon crassipalpe." In 1923, Roewer, in his enormous compendium, *Die Weberknechte der Erde*, indicated that he had not seen specimens of either *S. crassipalpe* or *S. cavicolens*, and based his discussion solely on specimens of *S. occidentalis* sent him by Nathan Banks. *Sabacon occidentalis* is a distinct species and not a synonym of *S. cavicolens*, though *S. spinosus* is. Considering Koch's description, and the fact that the types of *S. crassipalpe* are probably no longer in existence, *S. crassipalpe* should no longer be used as a name for North American forms and probably should be considered a *nomen dubium.*

3. The status of *Sabacon jonesi* Goodnight and Goodnight. Goodnight and Goodnight (1942) described *S. jonesi* from a single specimen taken in Natural Well Cave, near Monte Sano, Alabama. Although they stated that the holotype was a male, I found the undissected animal to be an early instar juvenile, possibly second or third, as suggested in the original description by the small size, weak pigmentation and sclerotization and extremely long legs. It is in fact similar to many immature specimens of *S. cavicolens* I have

examined. However, I hesitate to synonymize this name with *S. cavicolens* because the holotype of *S. jonesi* represents a far-southern record of the genus and may indeed prove to be a distinct species if and when mature material is collected. The holotype is in the American Museum of Natural History and is in poor condition.

NATURAL HISTORY

Species of the genus *Sabacon* almost universally seem to prefer moist, cool microhabitats. Many records are from caves, especially in California and the southern Appalachians, but none of the species are found there exclusively, or are modified for cave life. On the surface, specimens are usually found in areas such as moist, shaded ravines or well-developed forests where the humidity is high and temperatures are apt to be low.

Most of my personal observations have been made on *S. cavicolens*. The greatest success I have had in collecting this species has been at high elevations in mid-autumn. In the mountains of western North Carolina, at elevations over 5000 ft, the forest consists mostly of spruce, with Fraser fir becoming more prominent at higher elevations. Collecting in October on high peaks such as Richland Balsam and Waterrock Knob usually yield fair numbers of mature specimens of both sexes. Because individuals are apt to mature even later at lower elevations, after the normal collecting season in the northeastern United States is over, mature individuals of *S. cavicolens* are rather rare in collections. Most of the animals are to be found under wet rotting logs, or clinging to the undersides of stones; I have never seen any walking about actively during the day. Movements tend to be sluggish, certainly not as rapid as in other opilionids of similar form. High humidity seems to be the crucial requirement, and live specimens are difficult to keep and transport. I have never had any success in getting *S. cavicolens* back from the field alive. Collection notes on preserved specimens of the western species suggest a usual association with conifers and damp, cool microhabitats also. The holotype of *S. astoriensis* was collected in a Berlese sample of vegetable matter, including conifer duff and dried seaweed, taken from beach dunes in Oregon.

EVOLUTIONARY RELATIONSHIPS

Sabacon cavicolens, generally distributed over the eastern part of North America, south in the mountains to North Carolina, is very closely related to *S. paradoxum* of Europe. The known European species are likewise very similar and appear to be closely related. The other eastern species, *S. mitchelli*, is known only from a few high peaks in the southern Appalachians. It is quite different from *S. cavicolens*: the males lack cheliceral glands and do not have the first several abdominal tergites fused. They are also considerably smaller. The origins and affinities of this species are difficult to postulate, though it could be a relatively recent (Pleistocene) derivative of an isolated pre-*cavicolens* populations. The penis is very similar to that of *cavicolens*.

The western species seem most closely related to Asian forms (see Suzuki, 1964, 1965, 1966, etc.), though *S. occidentalis* and *S. siskiyou* also resemble *cavicolens* in many respects. With its unique chelicerae, genitalia and false articulations in the leg femora, *S. astoriensis* is much more closely related to Japanese species such as *S. dentipalpe* and *S. makinoi*. Although only a single male has been collected, it was taken from a unique (for *Sabacon*) habitat–dried seaweed and debris in beach dunes.

Tomicomerus bryanti is a unique animal that combines features found in "typical"

ischyropsalids and those found in *Sabacon*. Cheliceral glands are apparently absent, however. The palpi are armed with setae similar to those found in *Sabacon*, but are much more slender. The chelicerae are enlarged, but not as much as in *Taracus*. The femora of the legs have false articulations. What could be learned of the male genitalia from the single damaged specimen suggest *Taracus* rather than *Sabacon*. New material of this enigmatic species would be very welcome; it may represent an old stock that originated prior to the differentiation of the snail-eating genera.

A KEY TO NORTH AMERICAN TROGULOID GENERA

I present the following key without attempting to group the genera into families, since that is a question about which there is currently disagreement among taxonomists.

1a. Palpi stout, heavily set with stiff bristles (Fig. 12); cuticle mostly leathery, but well-sclerotized in males of some species; northeastern United States and southern Canada south in the mountains to North Carolina, central California north to southern Alaska . . . . . *Sabacon*

1b. Palpi more slender, not as heavily set with stiff bristles, but with more scattered, often glandular, hairs 2

2a(1b). Chelicerae enlarged, sometimes enormously so, the sum of the lengths of the two segments equal to or exceeding the length of the body 3

2b. Chelicerae normal, not as described in 2a 4

3a(2a). Chelicerae set with seta-bearing tubercles; leg femora without false articulations; Rocky Mountains from Alberta south to New Mexico, Coast Ranges and interior mountains of California, Oregon, Washington and British Columbia . . . . . *Taracus*

3b. Chelicerae smooth except for two proximal tubercles on distal segment (Fig. 34); leg femora with false articulations; region of Mt. St. Elias, Alaska . . . . . *Tomicomerus*

4a(2b). Length of body about 1 mm or less; legs covered with curly, decumbent setae; scattered localities in northeastern U.S., including New York, Ohio, Michigan, Missouri, West Virginia, North Carolina, Illinois and Indiana . . . . . *Crosbycus*

4b. Length of body greater than 1 mm; legs without decumbent curly setae . . . 5

5a(4b). Abdominal scutum and cephalothorax not separated by suture; palpi as long as or longer than body length; southern Appalachians as far north as Virginia; Illinois, Arkansas, Mississippi, Pacific northwest from northern California to central British Columbia . . . . . *Hesperonemastoma*

5b. Abdominal scutum and cephalothorax clearly separated by suture; palpi not as long as body length 6

6a(5b). Eye tubercle not extending forward over chelicerae, but with a short projection; dorsum poorly sclerotized; Veracruz . . . . . *Ruaxphilos*

6b. Eye tubercle extending forward over chelicerae; dorsum well sclerotized . . . 7

7a(6b). Ornamentation of abdominal dorsum consisting of large, blunt tubercles; eye tubercle lacking dorsal or lateral projections; Oregon . . . . . *Ceratolasma*

7b. Ornamentation of dorsum consisting of chitinous pegs and spines connected laterally to each other, especially on posterior margins of free abdominal segments, giving appearance of "lattice-work" suspended above dorsum; eye tubercle with lateral and sometimes dorsal projections 8

8a(7b). Eye tubercle with dorsal projections similar to ornamentation of dorsum; Mexico . . . . . *Trilasma*

8b. Eye tubercle without dorsal projections 9

9a(8b). Lateral projections of eye tubercle connected to each other by chitinous crossbars, giving appearance of perforations at margin of eye tubercle; southern California (San Diego) north to southern Oregon . . . . .*Ortholasma*

9b. Lateral projections of eye tubercle not connected; northern California to central British Columbia . . . . . .*Dendrolasma*

Simply because generic names appear in the above key does not mean that I think them valid, but instead, I feel each should be handled in detail, in the context of a generic revision. I might here suggest, however, that *Trilasma* and *Dendrolasma* probably ought to be considered synonyms of *Ortholasma*, and that *Ruaxphilos*, known from a single, probably immature specimen is very like juveniles of this same group of species.

TAXONOMY

Family Ischyropsalidae Simon

Genus *Sabacon* Simon

Sabacon Simon, 1879, Arachnides due France 7:266; Roewer, 1914, Arch. Naturg 80(3):123, 1923, *Weberknechte der Erde*, p. 694, 1950, Senckenbergiana 31:52; Comstock, 1940, *The Spider Book* (revised by W. Gertsch). pp. 77-78; Bishop, 1949, Proc. Rochester Acad. Sci. 9(3):173.

Nemastoma (part), L. Koch, Svenska-Akad. Handl. 16(5):111 *N. crassipalpis* Koch only.

Phlegmacera Packard, 1884, Amer. Nat. 18(2):203; Banks, 1901, Amer. Nat. 35(416):677.

Type-species–Of *Sabacon*, *S. paradoxus* Simon 1879 (name emended to *paradoxum* by Roewer, 1914), by original designation; of *Phlegmacera*, *P. cavicolens* Packard 1884, by original designation and monotypy.

Diagnosis–No other opilionid genus has the enlarged, bristly pedipalps of *Sabacon* species (Figs. 2, 12, etc.).

Description–Carapace usually broader than long, limits of sclerotized area often poorly marked; second thoracic tergite free and usually sclerotized, bearing on the midline a pair of prominent spines. Abdominal tergites sometimes fused to each other in males (*scutum parvum* of European authors), but last three tergites always free; in females each abdominal tergite sometimes divided at midline, usually small and poorly sclerotized. In both sexes, abdominal cuticle often with short, black setae, these frequently on cones on sclerotized tergites. Eye tubercle small, usually not ornamented (There is a spine on the eye tubercle in one Nepalese species, see Martens, 1973.), set back from margin of carapace; eyes small. Ozopores in usual position, small, not prominent. Front margin of carapace with a distinct median notch, or broadly indented between chelicerae, extending between chelicerae to large, triangular labrum; labrum well

sclerotized. Labium small, suboval. Sternum small, inconspicuous, sometimes not detectable in adults, in juveniles with two stout setae. Coxal endites of pedipalps and first legs large and prominent, sclerotic portion crescentic, sometimes with small setae. Coxal endites of legs two, three and four completely suppressed, not at all evident. Genital operculum large, blunt or pointed, setose, usually covering sternal area. Sternites of abdomen prominent, usually sclerotized, setose. Spiracles small, slit-like, nearly closed by cuticular granules. Legs long and thin in males, usually shorter and much stouter proportionally in females, with or without false articulations in femora and tibiae; accessory spiracles in tibiae lacking. Pedipalps much enlarged, femora and patellae cylindrical, patellae of males with distal teeth, tibiae much swollen distally, tarsi without claws, pyriform, reflexed on asetose areas of tibiae; patellae, tibiae and tarsi densely set with stiff setae that are not obviously glandular. Chelicerae of females normal. Chelicerae of males of most species with swollen dorsal glands on basal articles, form of gland varies with species. Male genitalia typical of family, penis long, shaft thin, glans with dorsal and ventral plates and apical structure, distal parts of shaft and glans plates with various strong setae. Ovipositor moderately long, not annulated, setation variable with species, apical divisions without special sense organs.

Distribution—Northern North America, Europe, Japan, Korea, eastern Siberia, Himalaya Mts. in Nepal.

KEY TO NORTH AMERICAN *SABACON* SPECIES

1a.	Males	2
1b.	Females	6
2a(1a).	Femora of legs with false articulations; north coastal Oregon (females unknown)	*astoriensis*
2b.	Femora of legs without false articulations	3
3a(2b).	Basal segment of chelicera without a knoblike gland (Fig. 11); high mountains of North Carolina	*mitchelli*
3b.	Basal segment of chelicera with a knoblike gland (Fig. 1)	4
4a(3b).	Tip of penis with fingerlike projections (Fig. 18); British Columbia south to northern California	*occidentalis*
4b.	Penis otherwise	5
5a(4b).	Cheliceral gland large, narrowed at base (Fig. 23); California, Oregon	*siskiyou*
5b.	Cheliceral gland smaller, rounded, not narrowed at base (Fig. 1); northeastern and midwestern United States	*cavicolens*
6a(1b).	Genital operculum pointed (Fig. 33); California	*briggsi*
6b.	Genital operculum evenly rounded	7
7a(6b).	Only first two abdominal segments sclerotized; high peaks in North Carolina	*mitchelli*
7b.	All abdominal segments with sclerotized patches	8
8a(7b).	Postocular spines very large and prominent (Fig. 25)	*siskiyou*
8b.	Postocular spines of normal size (Fig. 27)	9

9a(8b). Ovipositor short, sparsely setose (Fig. 8); eastern U.S. . . . . *cavicolens*
9b. Ovipositor longer, densely setose (Fig. 20); British Columbia south to northern California . . . . . *occidentalis*

Sabacon cavicolens (Packard)
Figs. 1-8, Map 1

Phlegmacera cavicolens Packard, 1884, Amer. Nat. 18(2):203, 1888, Mem. Nat. Acad. Sci. 4(1):54, Pl. XIV, Figs. 5a-g.

Sabacon crassipalpe (not of L. Koch), Roewer, 1914, Arch. Naturg. 80(3):125, Figs. 16a-c probably refer to *S. occidentalis*, 1923, *Weberknechte der Erde*, p. 694 (in part, not *S. crassipalpe* (Koch) or *S. occidentalis* [Banks]), Fig. 869 probably refers to *S. occidentalis*; Comstock, 1940, *The Spider Book* (revised by W. Gertsch), p. 77; Bishop, 1949, Proc. Rochester Acad. Sci. 9(3):173-174, pl. 1, Figs. 7-8 (records from northwestern states refer to *S. occidentalis*).

Sabacon spinosus Weed, 1893, Amer. Nat. 27(318):575, Fig. 1.

Phlegmacera cavicoleus [sic], Banks, 1901, Amer. Nat. 35(416):677, erratum for *cavicolens.*

Types–Female holotype of *P. cavicolens* from Bat Cave, Carter County, Kentucky (labelled only "Bat Cave"), in MCZ, examined; male holotype of *S. spinosus* from Hanover, New Hampshire, present location unknown.

Diagnosis–Sympatric only with *S. mitchelli*, a much smaller form endemic to a few high peaks in North Carolina. *Sabacon mitchelli* males lack the knoblike cheliceral gland found in *cavicolens* males. Females may be distinguished by the size difference and reduced abdominal sclerotization in *mitchelli.*

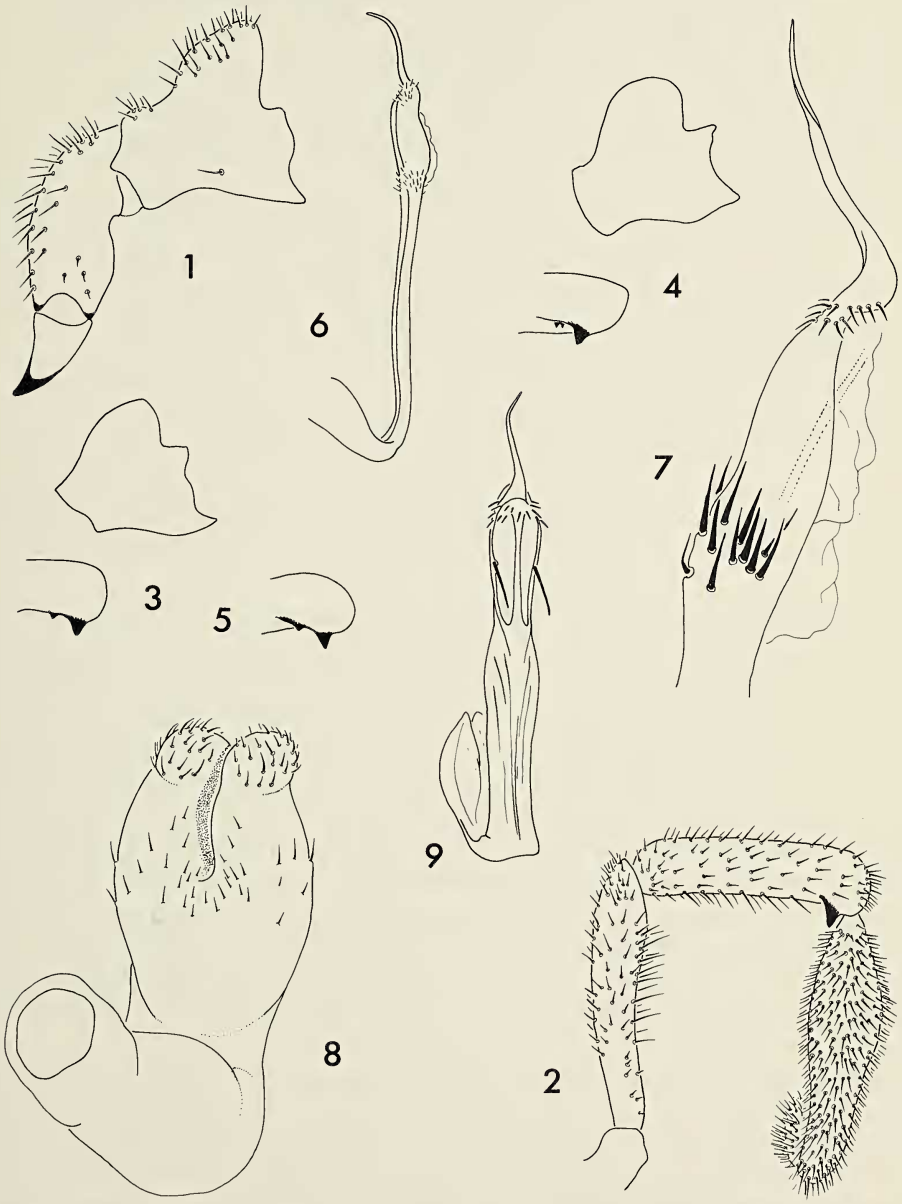
Description–Male from Ferne Clyffe State Park, Illinois. Total length, 2.4 mm. Carapace 0.55 mm wide, 0.48 mm long, with row of small black setae along anterior margin, anterior margin of carapace broadly indented; lateral borders poorly sclerotized. Ozopores small but distinct, rims not sclerotized. Eye tubercle 0.33 mm wide, eyes small. Second thoracic tergite poorly sclerotized, especially near midline, with row of small black setae set on bumps, middle two (postocular spines) much larger than others. Abdominal tergites 1-5 fused, but degree of fusion variable, some specimens have fifth tergite free; abdominal scutum so formed well sclerotized but flexible, with irregularly scattered stout black setae on tubercles. Abdominal tergites 6-8 free, but setae tending to form regular posterior rows; tergite 8 frequently divided and separated from lateral portions. Coxae, coxal endites, sternum and genital operculum as described for genus. Abdominal segments with moderately sclerotized sternites. Chelicerae (Fig. 1) of moderate size, setose, basal article with dorsal glandular prominence. Palpus (Fig. 2) typical of genus, femur 0.50 mm long, 0.21 mm wide, patella 0.48 mm long, 0.32 mm wide, with prominent apicomesal tooth, tibia 0.52 mm long, 0.32 mm wide, with mesoposterior asetose area against which tarsus is reflexed, tarsus 0.44 mm long, 0.20 mm wide. Legs of moderate length with minute black setae set thickly in tracts, scattered longer setae, metatarsi with numerous false articulations, tarsi long, multiarticulate, distally densely pilose, tarsal claw single, not toothed. Femora 1-4 2.22, 3.73, 2.05, 2.35 mm long respectively, tibiae 1-4 2.13, 3.63, 1.96, 2.01 mm long respectively. Penis (Figs. 6-7) with moderately long shaft, spatulate distal region bears short, stout setae, terminates in long aciculate process. Coloration: carapace yellowish brown, marked brownish purple near margins, eye tubercle brown with black rings around eyes, second thoracic

tergite mottled light purplish brown, abdominal scutum sclerotic yellow-brown, mottled dark purplish brown, with median rows of light yellowish white spots segmentally arranged. Venter yellow-white, lightly mottled brown. Chelicerae, legs and palpi pale tan.

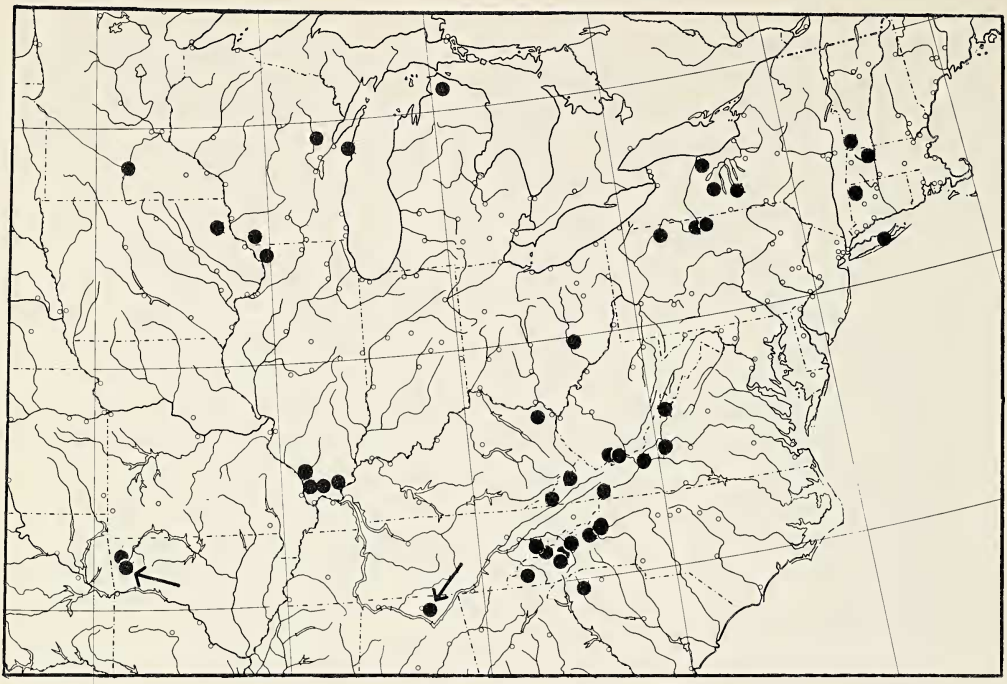
Female from Waterrock Knob, North Carolina. Total length, 5.2 mm. Carapace 1.44 mm wide, 0.71 mm long. Structure much as in male. Lateral margins of carapace more poorly defined than in male, anterior midline not broadly indented. Eye tubercle 0.21 mm wide. Second thoracic tergite hardly at all sclerotized, postocular spines not conspicuous. Abdominal tergites represented by small, suboval sclerotized plates (*scutum laminatum* of European authors) frequently divided into two or more irregular small sclerotized regions each (*scutum dissectum* of European authors). Both tergites and leathery cuticle with scattered small black setae, not on prominent tubercles. Venter of abdomen without obvious sclerotized sternites. Tip of genital operculum rounded. Chelicerae without glands on basal segments. Palpus heavier, more densely setose than in male, without patellar tooth, femur 1.21 mm long, 0.24 mm wide, patella 1.03 mm long, 0.31 mm wide, tibia 1.64 mm long, 0.50 mm wide, tarsus 0.30 mm long, 0.14 mm wide. Legs proportionally shorter and stouter than in male, femora 1-4 1.68, 2.89, 1.84, 1.82 mm long respectively, tibia 1-4 1.79, 2.90, 1.87, 1.61 mm long respectively. Ovipositor (Fig. 8) short, wide, very sparsely setose, apical region lightly sclerotized. Coloration as in male, but median light spots of abdomen fuse to form a stripe.

Records–See also Map 1. CANADA: *Quebec*: Laurentide Park, Camp le Relais, 3000 ft, 29 August 1956, H. Dybas, juvs. (CNHM). UNITED STATES: *Vermont*: Bennington Co., Mt. Equinox summit, 3500 ft, 18 October 1968, W. Shear, ♀♀ ♂ (WAS). *Massachusetts*: Franklin Co., Totem Lookout Trail, Mahawk State Park, 22 August 1956, H. and L. Levi, juv. (MCZ). *Connecticut*: Litchfield Co., Twin Lakes, Salisbury, 17 August 1964, H. Levi, juv. (MCZ). *New York*: Tompkins Co., Ithaca, numerous records, ♀♀ juvs.; Steuben Co., Plattsburg, 16 July 1926, ♀. Bishop (1949) also records the species from Monroe, Yates and Suffolk Counties. *Pennsylvania*: Potter Co., 4 mi E of Coudersport, 30 August 1963, W. Shear, juv. (WAS), Coudersport, 7 August 1967, W. Shear, juv. (WAS); McKean Co., Ludlow, 21 September 1943, ♀. *Ohio*: Hocking Co., Cantwell Cliffs State Park, 5 April 1927, M. Walker, juv. *West Virginia*: Mercer Co., Athens and vicinity, 20 June 1966, 2 July, 22 July 1967, juvs. (WAS), Camp Creek State Forest, 4 December 1970, W. Shear, ♀ (WAS). *Virginia*: Alleghany Co., 3 mi NW Clifton Forge, 10 September 1948, R. Hoffman (RLH?); Giles Co., Mountain Lake, 3800 ft, 27 September 1950 (RLH?), reported in Hoffman (1955); Lee Co., Cave Spring Recreation Area, 2 mi N of Dryden, 2-3 September 1972, R. Hoffman, juvs. (RLH); Highlands Co., Locust Spring Camp, 11 mi N of Monterey, 18 June 1969, W. Shear, juv. (WAS); Dickinson Co., Breaks Interstate Park, Cold Spring, 25 May 1967, W. Shear, juv. (WAS). *North Carolina*: Graham Co., Joyce Kilmer Memorial Forest, 20 May 1970, W. Shear, juv. (WAS); McDowell Co., Crabtree Falls on Blue Ridge Parkway, 14 July 1969, W. Shear, juv. (WAS); Haywood Co., Waterrock Knob summit, 6292 ft, 30 October 1970, ♀♀ (WAS), Richlands Balsam summit, 6400 ft, 10 October 1971, ♂♂ ♀♀ (WAS), 13 October 1970, W. Shear, ♂♂ ♀♀ (WAS): Jackson Co., Western Carolina University Preserve near Cullowhee, 25 October 1969, W. Shear, ♀ (WAS); Yancey Co., 4 mi SSE of Black Mountain Campground on Little Lost Cove Trail, 13 July 1969, W. Shear, juv. (WAS), Mt. Mitchell summit, 6500 ft, trail to Mt. Craig, 11 July 1969, juvs. (WAS; these specimens are early instars and some of them could be *S. mitchelli*), Mt. Mitchell summit, 6500 ft, 1 November 1970, ♂♂ ♀♀ (WAS); Bishop (1949) also records the species from Grandfather Mtn. and Blowing Rock. *South*

Carolina: Greenville Co., Greenville, 4 October 1930, N. Davis (reported in Hoffman, 1955). *Tennessee*: Sevier Co., Clingmans Dome summit, 6600 ft, 10 October 1971, W. Shear, ♂♀♀ (WAS), 2 mi NNW Newfound Gap, 13 October 1970, W. Shear, juv. (WAS), Laurel Creek, 8 October 1926, ♀♀. *Illinois*: Jo Daviess Co., Apple River Canyon State



Figs. 1-9.–Anatomy of *Sabacon* species. Figs. 1-8. *S. cavicolens*: 1, Left chelicera of male, lateral view; 2, Left palpus of male, mesal view; 3, Above: outline of proximal cheliceral article of male from Mt. Equinox, Vt. Below: distal end of palpal patella of same specimen; 4, Above: outline of proximal cheliceral article of specimen from Mt. Mitchell, N. Car. Below: distal end of palpal patella of same specimen; 5, Distal end of palpal patella of male from Union Co., Ill.; 6, Penis, lateral view; 7, Tip of penis, lateral view; 8, Ovipositor subdorsal view; 9, Penis of *S. mitchelli*, subventral view.



Map 1.—Eastern United States, showing distribution of *Sabacon cavicolens*, including records of immature specimens. Arrow in Alabama indicates locality of *S. jonesi*, a possible synonym of *S. cavicolens*; arrow in Arkansas indicates records of immature specimens possibly not *S. cavicolens*.

Park, 14-16 August 1946, H. Dybas, juvs. (CNHMM); Union Co., Pine Hills, 14-20 Ocotber 1967, J. M. Nelson, ♂♂ ♀♀ (JAB), 25 October 1969, J. Beatty, juv. (JAB); Johnson Co., Ferne Clyffe State Park, 24 October 1967, ♂♂ (JAB), 6 June 1970, J. Beatty, juv. (JAB); Pope Co., Lusk Creek 3 mi E of Eddyville (R6E, T12S, Sec. 10), 14-20 May 1968, J. M. Nelson, juvs. (JAB), Little Grand Canyon, 5.8 mi SW of Murphysboro, 3 May 1970, J. Beatty, juv. (JAB), *Iowa*: Clayton Co., Pikes Peak State Park, 8 June 1961, H. Levi, juv. (MCZ). *Wisconsin*: Kewaunee Co., N of Kewaunee, July 1949, H. Levi, juv. (MCZ); Grant Co., Wyalusing State Park, 13 July 1949, H. Levi, juv. (MCZ); Shawano Co., Neapit (?), 22 September 1949, H. Levi, ♂ (MCZ). *Minnesota*: Blue Earth Co., juv. (MCZ). The following juvenile specimens are tenatively referred to *S. cavicolens*: *Arkansas*: Washington Co., Devils Den, Ice Box Cave, 18 June 1969, S. and J. Peck, juvs. (WAS), Granny Dean Cave, 9 July 1969, S. Peck, juv. (WAS). Also reported from Cheboygan Co., *Michigan*, by Edgar (1971), and from *Kentucky*, *Maine* and *New Hampshire* by Bishop (1949).

Notes—The coloration is often much darker than the described specimen and probably depends on the age of the animal; the legs and palpi are often dark brown and the venter of the abdomen dark purplish brown. The sclerotization of the abdomen varies within populations, especially in females. Some females have each abdominal tergite divided, with the posterior ones very lightly sclerotized. In males, the degree of fusion of the first five abdominal tergites is variable, and in any case, the separate tergites are marked by indentations in the margin of the scutum; the fifth tergite is often free. Figs. 3-5 depict some components of the variation of the secondary sexual characters of the males. In most populations, the gland knob is rather low and slopes evenly on the anterior side (Figs. 1, 3), but in North Carolina specimens, the knob is larger and more rounded (Fig.

4). There is also a tendency for the palpal tooth to have one or even two small accessory teeth behind it (Figs. 3,4, 5). In some males, the apical part of the penis is bent over at a right angle, as shown in Fig. 15 for *S. occidentalis*. This is probably a functional change.

A few immature specimens from Arkansas caves are given in the records section and shown on the distribution map; mature material is much needed to definitely demonstrate that this population is *S. cavicolens*; see the discussion of *S. jonesi* above.

Sabacon mitchelli Crosby and Bishop
Figs. 9-13

Sabacon mitchelli Crosby and Bishop, 1924, J. Elisha Mitchell Soc. 40:23-24, Plate 2, Fig. 17.

Types–Female holotype (AMNH) from Mt. Mitchell, Yancey Co., North Carolina, 6600 ft elevation, collected 22 October 1923 by sifting moss; examined.

Diagnosis–Much smaller than *S. cavicolens*, with which it is sympatric throughout its range. The female has only the first two abdominal tergites sclerotized, and these quite small; the female of *cavicolens* has plates (though they may be divided) on all tergites of the abdomen. Males of *mitchelli* bear no knob on the basal articles of the chelicerae, though the glandular function may still be present; the palpal patella has a row of small denticles extending nearly the length of the patella behind three apical teeth. Males of *cavicolens* have an abdominal scutum, *mitchelli* males do not (Fig. 10).

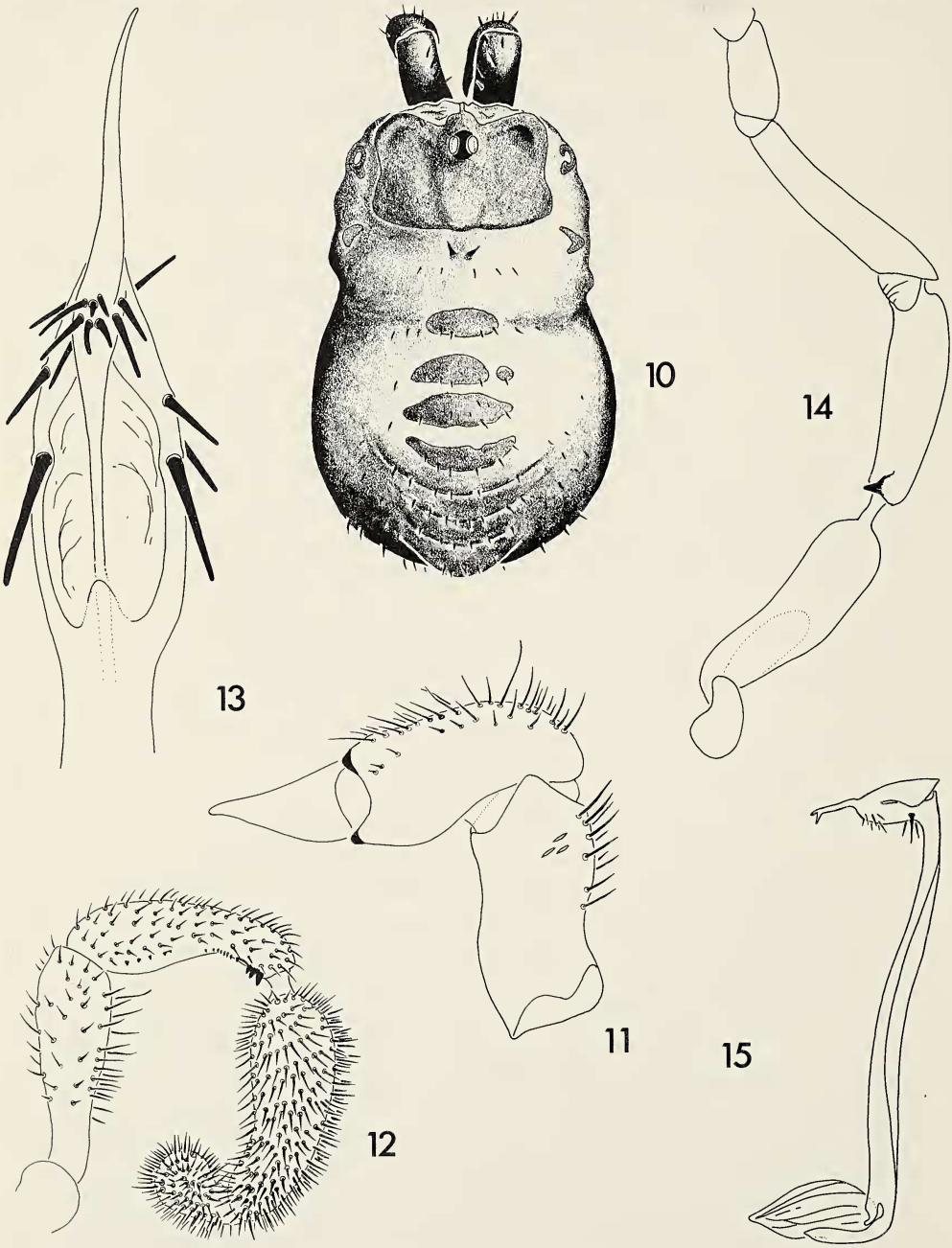
Description–Male from Waterrock Knob, Haywood Co., North Carolina. Total length, 1.83 mm. Carapace 0.48 mm long, 0.82 mm wide. Structure similar to *S. cavicolens*, except in the following respects. Carapace more heavily sclerotized, lateral margins more clearly defined. Ozopores large, prominent, with sclerotic posterior rims. Eye tubercle 0.27 mm wide. Second thoracic tergite not at all sclerotized, postocular spines somewhat enlarged but not as conspicuous as in *cavicolens*. Abdominal tergites (Fig. 10) poorly sclerotized, not fused to form dorsal scutum in most specimens, setae fewer and not on prominent bumps as in *cavicolens*. Chelicerae (Fig. 11) relatively larger than in *cavicolens*, lacking knobbed gland on basal article, but with three slit sensilla (?) not seen on other species. Palpus (Fig. 12) proportionally stouter than in *cavicolens*, femur 0.59 mm long, 0.16 mm wide, patella 0.58 mm long, 0.25 mm wide, with three large apicomesal teeth and series of small denticles running behind teeth nearly to base of patella, tibia 0.56 mm long, 0.24 mm wide, tarsus 0.30 mm long, 0.19 mm wide. Legs short, stout, metatarsi with but one or two false articulations, tarsi multiarticulate, but distitarsus not completely divided, legs set with fine setae and long spines. Femora 1-4, 0.95, 1.01, 0.75, 1.18 mm long respectively, tibiae 1-4 0.71, 0.87, 0.64, 1.04 mm long respectively. Penis with short, broad shaft (Fig. 9) not significantly increased in width at apical part (Fig. 13), aciculate process as in *cavicolens*, penial setae longer, stouter. Coloration: Dorsum light purplish brown, carapace and abdominal tergites yellowish, coloration even, no evidence of dorsal pattern. Venter, leg coxae and trochanters light brown, distal parts of legs darker brown, chelicerae and palpi medium brown.

Female holotype from Mt. Mitchell, Yancey Co., North Carolina. Total length, 2.71 mm. Carapace 0.49 mm long, 0.98 mm wide. Eye tubercle 0.25 mm wide. Structure typical. Second thoracic tergite not at all sclerotized, postocular spines small. First two abdominal tergites with small plates, others not sclerotized. Coloration as in male.

Records–*North Carolina*: Haywood Co., Waterrock Knob summit on Blue Ridge Parkway, 6292 ft, under rocks and logs in fir forest, 13 October 1970, W. A. Shear, ♂ (WAS);

Yancey Co., Mt. Mitchell summit, 6600 ft, under logs and rocks in forest of fir and mountain ash, 1 November 1970, W. A. Shear, ♂♂ (WAS).

Notes—At each of the two places this species has been collected, it is syntopic with *S. cavicolens*. In the cases of my two collections, the *mitchelli* males were only later dis-



Figs. 10-15.—Anatomy of *Sabacon* species. Figs. 10-13. *S. mitchelli*: 10, Body of male, dorsal view; 11, Left chelicera of male, lateral view; 12, Left palpus of male, mesal view; 13, Penis, ventral view of tip; Figs. 14-15, *S. occidentalis*; 14, Left palpus of male, mesal view, setation omitted; 15, Penis, lateral view.

covered in a large collection of adult *cavicolens*. I have collected on several other Appalachian summits in the region, and found only *cavicolens*. There is some variation. The Waterrock Knob male has broader and larger abdominal tergites than the illustrated male from Mt. Mitchell, but otherwise, they agree closely.

Sabacon occidentalis (Banks)
Figs. 14-20, Map 2

Phlegmacera occidentalis Banks, 1894, Psyche 7:51.

Sabacon crassipalpe (not of L. Koch), Roewer, 1914, Arch. Naturg. 80(3):125, 1923, *Weberknechte der Erde*, p. 694, Fig. 869 (in part, not *S. cavicolens* [Packard], *S. spinosus* Weed, or *S. crassipalpe* [Koch]); Comstock, 1940, *The Spider Book* (revised by W. Gertsch), p. 77 (not *S. cavicolens* [Packard]); Bishop, 1949, Proc. Rochester Acad. Sci. 9(3):173-174 (description based on *S. cavicolens*, western records only).

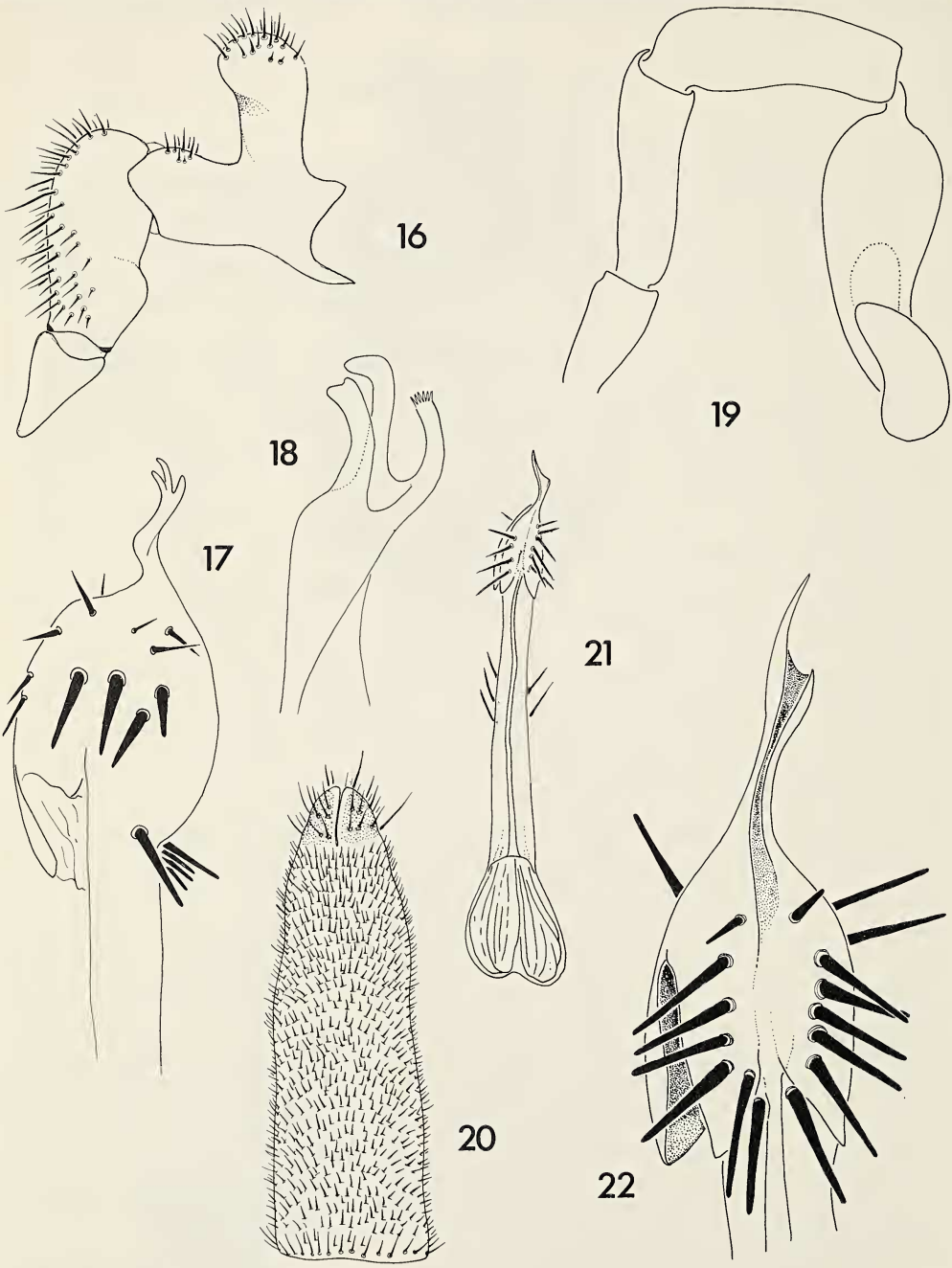
Type–Male and female cotypes from Olympia, Washington, in MCZ, examined.

Diagnosis–The form of the penis and the less prominent postocular spines will serve to separate the present species from *S. siskiyou*. *Sabacon astoriensis* has false articulations in the leg femora, *occidentalis* does not. Males of *S. briggsi* are not known, but the females of that species have a pointed genital operculum.

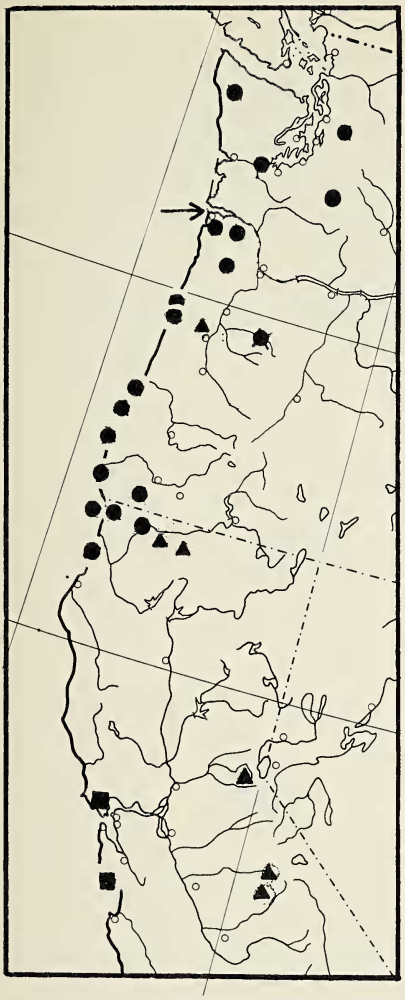
Description–Male from Cape Perpetua, Lincoln Co., Oregon. Total length, 2.34 mm. Carapace 1.26 mm wide, 0.59 mm long. Structure much as in *S. cavicolens*, but much less sclerotization in carapace and abdomen, lateral margins of carapace not at all distinct. Anterior margin of carapace indented, lacking row of black setae. Ozopores small, indistinct, rim not sclerotized as in *mitchelli*. Eye tubercle 0.36 mm wide, eyes small. Second thoracic tergite unsclerotized but marked by pigmented band, postocular spines small, unpigmented. Abdominal tergites 1-5 fused to form dorsal scutum, setae as described for *cavicolens*. Abdominal tergites 6-8 free. Coxae, coxal endites, sternum and genital operculum as described for genus, set with small black setae, sternum poorly sclerotized, without setae. Chelicerae (Fig. 16) relatively large, basal articles with very large, prominent glandular knob. Palpus (Fig. 14) narrow, gracile, elongate, femur 0.81 mm long, 0.17 mm wide, patella 0.82 mm long, 0.27 mm wide, with very large single black apicomesal tooth, tibia 1.08 mm long, 0.30 mm wide, tarsus 0.40 mm long, 0.25 mm wide. Legs very long and slender, femora with regular rows of stout black setae. Tibiae of legs 2 with five to eight false articulations, of legs 4 with one to three false articulations. Femora 1-4 3.56, 6.27, 4.57, 5.47 mm long respectively; tibiae 1-4 3.86 6.20, 3.98, 5.40 mm long respectively. Penis (Figs. 15, 17, 18) with long, thin shaft, broadened, spatulate apical region with numerous stout setae, tip with three finger-like divisions (Fig. 18). Coloration: Eye tubercle black. Carapace yellow-white to brown, marked darker brown, second thoracic tergite and dorsal scutum dark brown against yellow-white ground, vaguely marked light brown central band. Venter yellow-white to tan, marked dark brown. Chelicerae white. Palpus yellow-white, shaded brown dorsally on femur and patella. Leg trochanters brown dorsally, leg segments shaded dark brown distally, giving impression of banded legs.

Females from Clatskanna, Columbia Co., Oregon. Total length, 4.32 mm. Carapace 0.90 mm long, 2.00 mm wide. Structure much as in male and in female of *cavicolens*, but carapace proportionally longer, eye tubercle (0.54 mm wide) set farther back from anterior margin of carapace. Second thoracic tergite poorly sclerotized, abdominal tergites all free, marked by sclerotized oval plates, sparsely set with small black

setae. Venter typical. Chelicerae lacking gland on basal article. Palpus (Fig. 19) much heavier and stouter proportionally than in male, femur 1.08 mm long, 0.31 mm wide, patella 1.35 mm long, 0.38 mm wide, tibia 1.71 mm long, 0.60 mm wide, tarsus 0.75 mm



Figs. 16-22.–Anatomy of *Sabacon* species. Figs. 16-20: *S. occidentalis*. 16, Left chelicera of male, lateral view; 17, Penis, lateral view of tip; 18, Penis lateral view of tip, higher magnification; 19, Left palpus of female, mesal view, setation omitted; 20, Ovipositor, ventral view. Figs. 21-22. *S. siskiyou*: 21, Penis, dorsal view; 22, Penis, dorsal view of tip.



Map 2.–Coastal northern California, Oregon and Washington. Dots, records of *Sabacon occidentalis;* triangles, records of *S. siskiyou;* squares, records of *S. briggsi.* Arrow shows approximate type locality of *S. astoriensis. Sabacon occidentalis* has also been recorded from British Columbia.

long, 0.42 mm wide. Legs long, but shorter and stouter proportionally than in male, femora 1-4 2.77, 4.49, 2.88, 5.63 mm long respectively, tibiae 1-4 2.84, 3.41, 2.72, 3.93 mm long respectively. Ovipositor (Fig. 20) relatively long, densely setose. Coloration as in male, but generally paler, central light band of abdomen consequently not as distinct.

Records–See also Map 2. CANADA: *British Columbia*: Kyquot, Vancouver Island, 1-10 September 1930, S. L. Neave, ♀; 17.8 mi E of Hope, Manning Park, 23 August 1969, T. Briggs, ♂ (TB). UNITED STATES: *Washington*: Grays Harbor Co., 5 mi E of McCleary, 26 August 1959, W. Gertsch, V. Roth, ♀; Snohomish Co., 6 mi W of Stevens Pass, near Senic, 28 August 1959, W. Gertsch, V. Roth, ♀; Jefferson Co., 4.5 mi SW Hoh Rain Forest on Hwy 101, 22 June 1966, T. Hom, ♂ (TB); Lewis Co., Rainbow Falls State Park, 25 August 1969, T. Briggs, ♂ (TB). *Oregon*: Clatsop Co., 7 mi N of Nehalem, 26 August 1969, T. Briggs, ♀ (TB), Saddle Mtn., 9 September 1970, R. Lem, ♀ (TB). Lincoln Co., 5 mi N of Depoe Bay on Hwy 101, 4 September 1970, T. Briggs et al., (TB), Cape Perpetua on U.S. 101, 7 August 1967, T. Briggs, ♂♂ (TB); Lane Co., Darlington Botanical Wayside near Mercer Lake, 20 June 1966, T. Briggs, ♀ (TB); Columbia Co., 5 mi S of Clatskannie, 8 August 1967, K. Hom, ♀ (TB); Josephine Co., 3.9 mi E on I-5 of Speaker Road, near Wolf Creek, 8 June 1967, T. Briggs et al., ♀ (TB); Yamhill Co., McMinnville, "McNab Coll." August (no year) ♂♂ ♀♀ (MCZ); Coos Co., Charleston, 30 September 1959, V.

Roth, ♀; Linn Co., 1.1 mi E jct. U.S. 20 and U.S. 126, 24 June 1966, T. Briggs, ♂♂ ♀♀ (TB); Douglas Co., 3 mi E of Reedsport, 6 August 1967, T. Briggs, ♂ (TB); Curry Co., 9.5 mi S of Gold Beach, 19 June 1966, T. Briggs, et al., ♂♂ ♀♀ (TB). *California*: Siskiyou Co., 18 mi N of Happy Camp, 22 August 1959, W. Gertsch, V. Roth, ♀; Humboldt Co., near Orick, 18 June 1966, T. Briggs et al., ♂ (TB); Del Norte Co., Del Norte Coast Redwoods State Park, 25 June 1966, T. Briggs et al., ♂♂ (TB), 1.6 mi N of Del Norte Coast Redwoods State Park, 18 June 1966, T. Briggs et al., ♂♂ (TB).

Notes–There appears to be little variation in the important characters of *S. occidentalis*, except that some specimens are darker or lighter than the described ones.

Sabacon siskiyou, new species
Figs. 21-25, Map 2

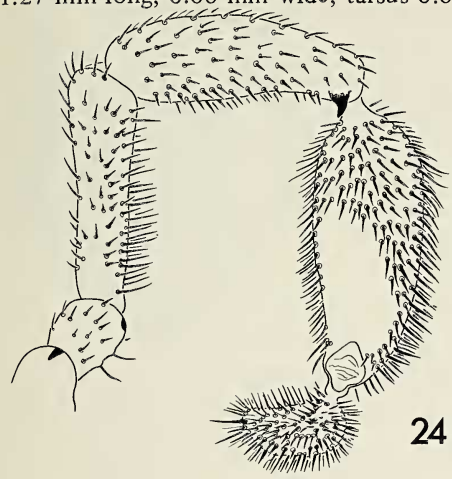
Types–Male holotype and female paratype from 3 mi north of McCloud, Siskiyou Co., California, collected 2 September 1959 by W. Gertsch and V. Roth (AMNH); female paratype from 6 mi east of Camp Connell, Eldorado Co., California, collected 10 September 1959 by W. Gertsch and V. Roth (MCZ), male paratype from Deadhorse Summit, near Pondosa, 5500 ft, Siskiyou Co., California, collected 19 September 1961 by W. Ivie and W. Gertsch (MCZ). The specific epithet refers to the type locality and is a noun in apposition.

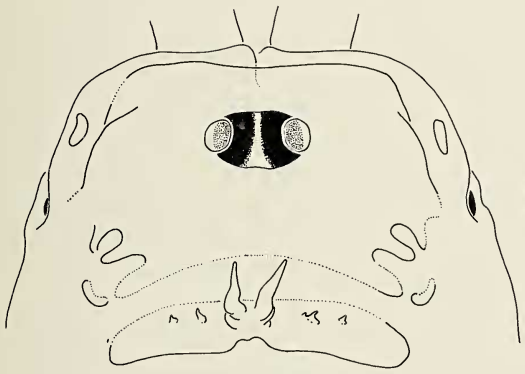
Diagnosis–Similar in general appearance to *S. occidentalis*, but with considerably shorter, unbanded legs, a differently formed penis, and very large, prominent postocular spines (Fig. 25). Distinct from *S. astoriensis* in lacking false articulations in the leg femora.

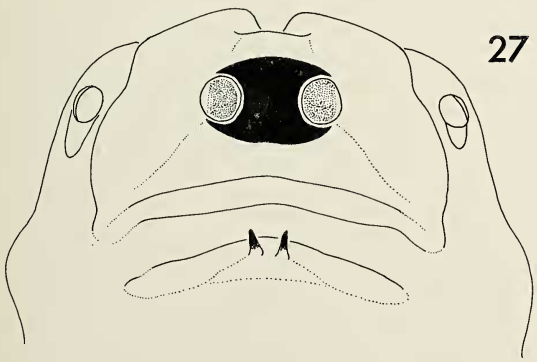
Description–Male paratype from Deadhorse Summit. Total length, 2.49 mm. Carapace 0.57 mm long, 1.11 mm wide. Structure typical for genus, but usually much less sclerotization even in the darkest specimens than in *cavicolens* or *occidentalis*. Carapace fairly well defined, however. Eye tubercle 0.28 mm wide, eyes small. Ozopores small, inconspicuous, without marginal sclerotization. Second thoracic tergite weakly sclerotized, but with large, prominent postocular spines (Fig. 25), often contiguous at the base or even partly fused. Presence of dorsal abdominal scutum difficult to ascertain due to weak sclerotization, but probably much as in *occidentalis*; abdominal cuticle comparatively smooth, with only a few small, dark brown, scattered setae. Venter typical, with rather long, weak black setae contrasting with stout ones found in other species. Abdominal sternites not sclerotized but marked with pigment. Chelicerae (Fig. 23) much as in *occidentalis*, but gland lower, not as much enlarged at apex. Palpus (Fig. 24) somewhat stouter than in *occidentalis*, femur 0.64 mm long, 0.25 mm wide, patella 0.82 mm long, 0.36 mm wide, apicomesal tooth large, single, usually slightly recurved, tibia 0.80 mm long, 0.37 mm wide, tarsus 0.44 mm long, 0.36 mm wide. Legs shorter, stouter than in *occidentalis*, setation pattern essentially the same, but larger setae longer, thinner. Tibiae 2 with one to three false articulations, tibiae 4 with none. Femora 1-4 1.84, 3.90, 1.85, 2.57 mm long respectively, tibiae 1-4 1.80, 2.66, 1.60, 2.22 mm long respectively. Penis (Figs. 21, 22) somewhat stouter than in *occidentalis*, with more and stouter setae, tip unevenly spatulate. Coloration: Pattern of body as in *occidentalis*, but paler, yellow-white areas in *occidentalis* tend to be pale tan in *siskiyou*; legs even medium brown, not banded.

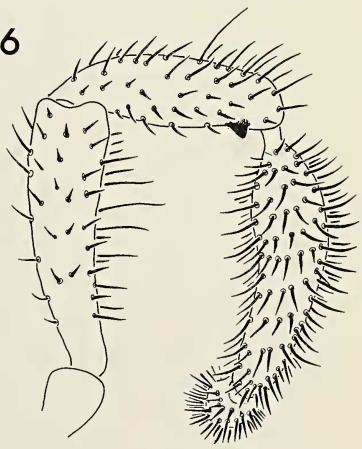
Female from Eldorado Co., California. Total length, 2.77 mm. Carapace 0.59 mm long, 1.46 mm wide. Structure as described in male, with the usual sexual differences. Abdominal tergites fairly well marked, sometimes divided. Genital operculum

rounded at tip, ovipositor similar to that of *occidentalis*, only slightly less setose. Palpus with femur 0.90 mm long, 0.34 mm wide, patella 1.10 mm long, 0.48 mm wide, tibia 1.27 mm long, 0.66 mm wide, tarsus 0.65 mm long, 0.32 mm wide. Legs proportionally









Figs. 23-28.–Anatomy of *Sabacon* species. Figs. 23-25. *S. siskiyou*: 23, Left chelicera of male, lateral view; 24, Left palpus of male, mesal view; 25, Anterior end of body of male, dorsal view. Figs. 26-28. *S. astoriensis*: 26, Left palpus of male, mesal view; 27, Anterior end of body of male, dorsal view; 28, Penis, lateral view.

shorter and stouter than in male, femora 1-4 2.14, 2.66, 1.83, 2.46 mm long respectively, tibiae 1-4 1.85, 2.63, 1.61, 2.26 mm long respectively. Coloration as in male.

Records–*California*: Siskiyou Co., Deadhorse Summit, near Pondosa, 5500 ft, 18 September 1961, W. Ivie, W. Gertsch, ♂; Eldorado Co., 6 mi E of Camp Connell, 10 September 1959, W. Gertsch, V. Roth, ♀; Madera Co., 2 mi S of Fish Camp, 12 September 1959, V. Roth, W. Gertsch, ♀; Yosemite National Park, Strawberry Creek, 12 September 1959, V. Roth, W. Gertsch, ♀. *Oregon*: Benton Co., near Iron Mtn., 21 November 1948, I. Newell, ♂♂.

Notes–The Oregon males are darker in coloration and somewhat better sclerotized than those from California, but are otherwise typical.

Sabacon astoriensis new species
Figs. 26-30, 32, Map 2

Types–Male holotype from Peter Iredale Shipwreck Picnic Area, Fort Stevens State Park, Clatsop Co., Oregon, collected 27 November 1971 by E. M. Benedict (MCZ). The specific epithet is an adjective referring to the nearby community of Astoria.

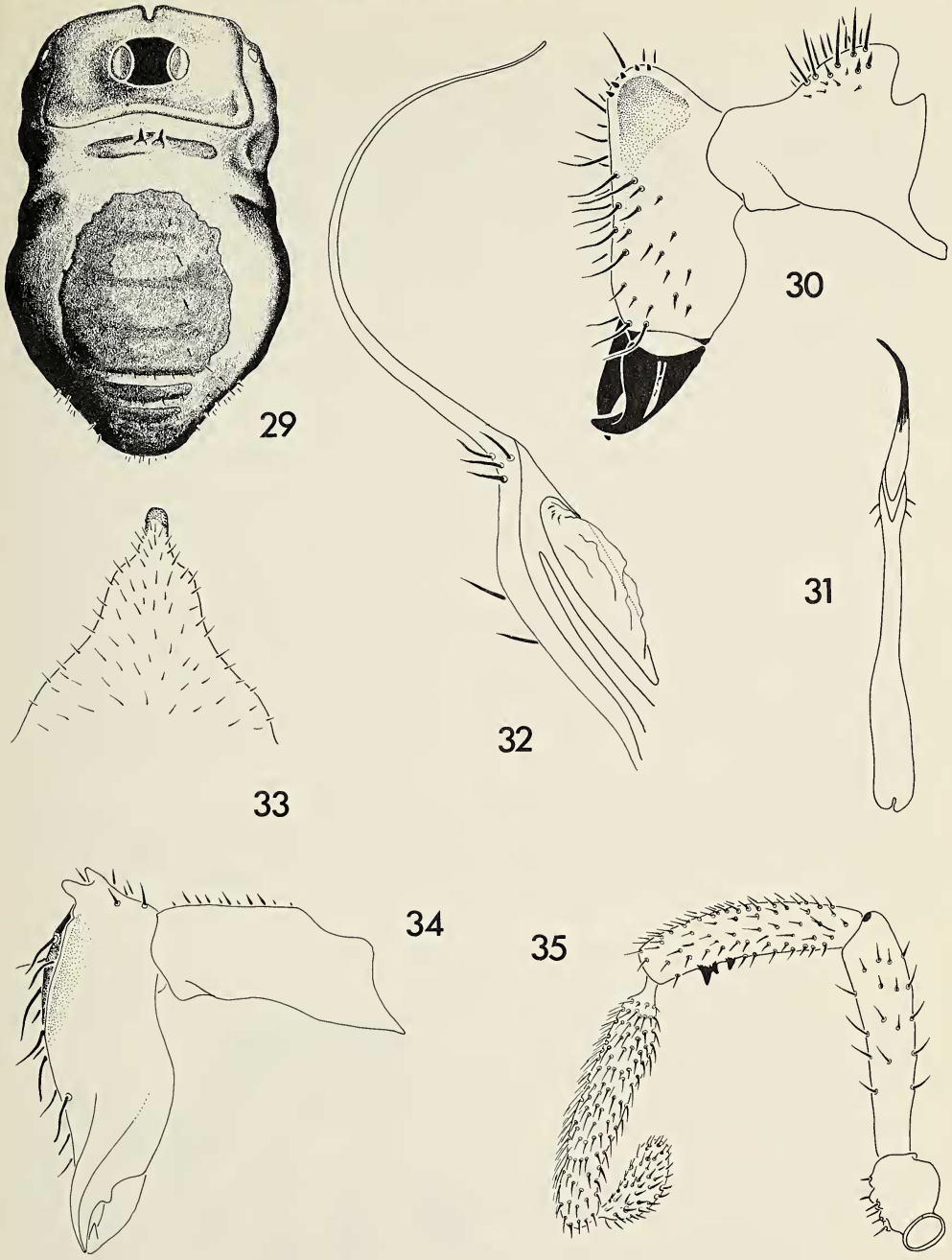
Diagnosis–The only American species with false articulations in the leg femora.

Description–Male holotype. Total length, 2.0 mm. Carapace 0.52 mm long, 0.78 mm wide. Carapace well-sclerotized, lateral margins distinct, anterior margin with an acute indentation at midline. Ozopores large, distinct, posterior rims sclerotized. Eye tubercle 0.26 mm wide, relatively larger than in other species, set closely at anterior margin of carapace, eyes large. Second thoracic tergite moderately well-sclerotized, postocular spines small but pigmented (Fig. 27). Abdominal tergites 1-5 solidly fused to form heavily sclerotized dorsal shield, tergites 1-4 marked by pairs of black setae on low humps, tergite 5 with posterior row of black setae. Tergite 8 divided in midline, lateral portions of tergite 8 also separate from dorsal portions. Posterior part of abdominal dorsum with scattered black setae (Fig. 29). Coxae, endites and genital operculum typical, sternum completely suppressed. Abdominal sternites sclerotized, with rows of black setae. Chelicerae (Fig. 30) with low glands on basal segments resembling those of *cavicolens*, distal segment enlarged dorsobasally with depressed lateral area bearing small denticles on rim. Palpus (Fig. 26) slender, gracile, not as heavily setose as in some other species, femur 0.60 mm long, 0.20 mm wide, patella 0.58 mm long, 0.21 mm wide, with stout patellar tooth, tibia 0.59 mm long, 0.22 mm wide, tarsus 0.25 mm long, 0.18 mm wide. Legs short, stout, sparsely setose. Femora 1 and 3 with one to three false articulations, femur 2 with nine to ten false articulations, femur 4 with four to five false articulations, tibiae 2 and 4 with one to four false articulations. Femora 1-4 1.11, 1.63, 0.95, 1.63 mm long respectively, tibiae 1-4 1.05, 1.55, 0.84, 1.21 mm long respectively. Penis (Figs. 28, 32) with broadly expanded tip gradually tapering to flagelliform termination (Fig. 32), penial setation weak. Coloration: Sclerotized parts dark brown, intersegmental cuticle white. Legs, palpi and chelicerae brown, darker distally, legs not banded.

Female unknown.

Known only from the type locality.

Notes–This peculiar species is related to one or two of the Japanese forms, as suggested by the penis and the false articulations in the leg femora. The modification of the distal cheliceral article is unique. Some of the species recently described from Nepal by Martens (1972) have stout teeth on the inner sides of the proximal part of the distal cheliceral article, but none have the lateral depression seen in *astoriensis*. The small size



Figs. 29-35.–Anatomy of *Sabacon* and *Tomicomerus* species: 29, Body of male *S. astoriensis*, dorsal view; 30, Left chelicera of male *S. astoriensis*, lateral view; 31, Penis of *Tomicomerus bryanti* (partly hypothetical, see text); 32, Penis of *S. astoriensis*, lateral view of tip; 33, Genital operculum of female *S. briggsi*, ventral view; 34, Right chelicera of *T. bryanti*, mesal view; 35, Right palpus of *T. bryanti*, mesal view.

and heavy sclerotization are also of interest. Collectors in northern coastal Oregon should search carefully for females.

The type was taken in a Berlese sample of dried seaweed, vegetable debris and spruce duff in sand dunes, near the beach.

Sabacon briggsi, new species
Fig. 33, Map 2

Types–Female holotype from Bolinas Ridge, Marin Co., California, collected 16 November 1968 by T. Briggs (deposited in California Academy of Sciences); female paratype from Valencia Lagoon, Santa Cruz Co., California, collected 25 November 1966 by K. Hom (MCZ).

Diagnosis–Distinct from females of all other species in the pointed and lightly sclerotized tip of the genital operculum (Fig. 33).

Description–Female holotype. Total length, 3.86 mm. Carapace 0.71 mm long, 1.37 mm wide. Carapace with lateral margins indistinct, as in *occidentalis*, but anterior margin deeply and broadly indented in midline. Eye tubercle 0.45 mm wide, eyes small. Ozopores small but prominent, anterior margins sclerotized. Second thoracic tergite poorly and narrowly sclerotized, postocular spines small and not conspicuous. All abdominal tergites marked by undivided separate sclerotized plates set with short black setae. Venter typical, but genital operculum apically pointed, with lightly sclerotized rim (Fig. 33). Chelicerae typical. Palpus with short femur, extremely robust tibia; femur 0.92 mm long, 0.31 mm wide, patella 1.22 mm long, 0.34 mm wide, tibia 1.43 mm long, 0.80 mm wide, tarsus 0.68 mm long, 0.47 mm wide. Legs short, stout, femora 1-4 2.02, 3.10, 1.95, 3.14 mm long respectively, tibiae 1-4 1.94, 3.10, 1.64, 2.63 mm long respectively. Ovipositor as in *occidentalis*. Coloration: Ground color of body light purple mottled medium tan, sclerotized parts brown. Venter white, abdominal sternites brown. Chelicerae brown dorsally, palpi medium brown, legs medium brown, not annulated.

Males not known.

Known only from type and paratype localities listed above.

Notes–The Santa Cruz Co. female agrees well in structure with the holotype but is lighter in color, possibly a result of longer preservation. It was taken from oak litter.

Genus *Tomicomerus* Pavesi

Tomicomerus Pavesi, 1899, Rend. Inst. Lombardo 32 532-533; Roewer, 1914, Arch. Naturg. 80(3):126, 1923, *Weberknechte der Erde*, p. 696; Comstock, 1940, *The Spider Book* (rev. by W. Gertsch), p. 78.

Phlegmacera Banks (in part), 1898, Ent. News 9:16, *P. bryanti* only.

Type-species–*T. bispinosus* Pavesi, 1899, (=*T. bryanti* [Banks]), by original designation.

Diagnosis–The leg femora have false articulations, a character also found in some *Sabacon* species, but the chelicerae of *T. bryanti* are much enlarged. Distinct from species of *Taracus*, *Ischyropsalis* and *Nipponopsalis* by the shorter, more densely setose palpi and the smooth chelicerae.

Description–Carapace (Fig. 36) wider than long, well sclerotized, lateral limit well marked, indented in midline. Ozopores in usual position. Eye tubercle much broader than long, indented in midline, without setae or ornamentation. Second thoracic tergite free and well-sclerotized, bearing on midline pair of a very prominent postocular spines (in *Taracus* species there is usually a single spine in this position). Condition of abdominal tergites not discernable from single available specimen. Carapace connected to labrum by chitinous strip, labrum large, subtriangular. Labium small, oval. Sternum not obvious, poorly sclerotized. Endites of pedipalps and legs as in *Sabacon*, but coxae slightly com-

pressed and elongated proximally. Genital operculum bluntly pointed anteriorly. Spiracles slit-like. Legs moderately long, with false articulations in femora and tibiae. Palpi prominent, intermediate in form between *Sabacon* and *Taracus* (Fig. 35), tarsus blunt, reflexed against asetose area on tibia, without a claw, patella with mesoapical teeth in males. Chelicerae very large, basal joint as long or longer than carapace without a prominent glandular swelling in males, distal joint with two proximodorsal teeth and mesal ridge (Fig. 34). Male genitalia typical, perhaps approaching form of *Taracus* species (Fig. 31). Form of ovipositor not known.

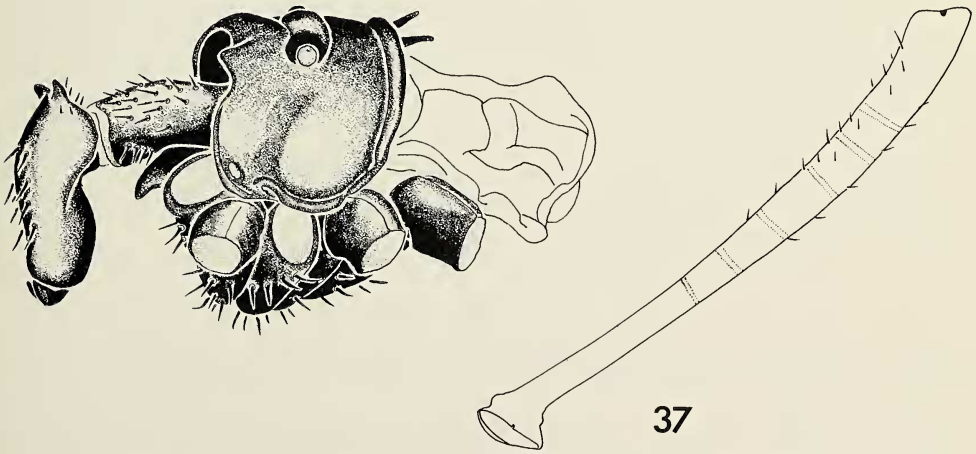
Distribution–Southeastern coastal strip of Alaska.

Tomicomerus bryanti (Banks)
Figs. 31, 34-37

Phlegmacera bryanti Banks, 1898, Entomol. News 9:16.
Tomicomerus bispinosus Pavesi, 1899, Rend. Inst. Lombardo 32:533.
Tomicomerus bryanti, Roewer, 1914, Arch. Naturg. 80(3):126, 1923, *Weberknechte der Erde*, p. 696; Comstock, 1940, *The Spider Book* (rev. by W. Gertsch), p. 78.

Types–Female (immature?) holotype from Malaspina Glacier, Mt. St. Elias, Alaska, collected 4 July 1897 by H. G. Bryant, probably lost, not found with other Banks opilionid types in MCZ; male holotype of *T. bispinosus* from Mt. St. Elias, whereabouts unknown. An inquiry of the Zoological Laboratory of the University of Pavia, where Pavesi worked, brought no answer. In the absence of types, there is a certain amount of conjecture involved in assigning the American Museum specimen described below to this species, and indeed in accepting the synonymy of the two proposed names. The AMNH specimen matches Pavesi's description well, but Banks' account is less detailed and is probably based on an immature specimen, judging from the size given.

Description–Specimen from Tsirku River, Alaska. The specimen is in poor condition, as is much of the older material in the AMNH opilionid collection, due to a yellow



Figs. 36, 37.–*Tomicomerus bryanti*: 36, Lateral view of male from Tsirku River. Abdomen unshaded, shown in outline only to denote shriveled condition due to poor preservation; 37, Leg 4 (?) femur, showing false articulations.

substance dissolved out of either cork or rubber stoppers. In addition to staining the specimens, this substance seems to give them a cheese-like texture that renders study and dissection difficult. When fresh alcohol is added without extensive rinsing, a heavy white precipitate forms.

Structure as described for genus. Abdomen completely shriveled, but described by Pavesi (1899) as "polished." Legs separated from body and badly broken. Carapace 1.11 mm wide, 0.77 mm long, eye tubercle 0.46 mm wide. Chelicera (Fig. 34) with basal segment 0.85 mm long, 0.36 mm wide, distal segment, excluding fixed finger, 1.00 mm long, 0.44 mm wide. Palpal femur 1.20 mm long, 0.27 mm wide, patella 1.07 mm long, 0.27 mm wide, with three mesodistal teeth, the largest most distal and contiguous with the smallest, the third some distance proximal of the other two (Fig. 35), tibia 1.36 mm long, 0.28 mm wide, tarsus 0.47 mm long, 0.18 mm wide. Legs with false articulations in femora and tibia numerous (Fig. 37). Legs broken or not identifiable. Male genitalia (Fig. 31) partially reconstructed, badly damaged by attempted dissection, but generally resembling those of *Taracus* species.

Notes—All reported specimens come from the St. Elias Range area of the Alaskan coastal strip extending south to British Columbia. The specimen in the AMNH is labelled as being from the head of the Tsirku River, Alaska, and was collected in July or August of 1910, by O. M. Leland. This stream rises from the Tsirku Glacier at an elevation of 1100 ft and flows east to the Chilkat River, joining that river just before it empties into Chilkat Inlet. The head of the Tsirku River is at 137 degrees 30 minutes west longitude and 60 degrees 30 minutes north latitude, just north of the northern boundary of Glacier Bay National Monument.

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